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非口語話輪輪轉線索應用於高齡者與機器人休閒對話情境之研究

How Non-verbal Turn-taking Cues Affect Elderly Communication with a Social Robot in a Casual Conversation Setting

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摘要

因應全球化高齡社會與隨之而來的照護人力缺口，越來越多研究開始探討如何將社會機器人應用於高齡照護以提升其生活福祉。為了讓機器人擁有更好的對話技巧，經常被應用在人類對話中的非口語話輪輪轉線索如何在高齡者與社會機器人的休閒對話中被使用是本研究的主要研究目標。

為回應本研究的研究問題：高齡者是否會注意並使用非口語話輪輪轉線索以達到順暢的對話？不同的非口語話輪輪轉線索組合如何影響高齡者與機器人的對話順暢度及對話經驗？本研究採取實驗研究以探討非口語話輪輪轉線索與其的不同組合對於非口語話輪輪轉線索的注意、對話順程度及人機互動經驗的影響。實驗參與者須與機器人 NAO 在下午茶情境中進行休閒對話。本研究使用實驗對話行為與自陳問卷來測量上述變項。

一共 47 位六十歲（含）以上的高齡者參與實驗。研究結果顯示高齡參與者能夠感知非口語話輪輪轉線索並與機器人完成順暢的對話。雖然不同的非口語話輪輪轉線索組合並不影響主觀對話經驗的評估，客觀行為的話輪輪轉時間顯示使用視線與手勢可以顯著提升高齡者與機器人的對話順暢度。

總結而言，在設計目的為與高齡者進行休閒對話的機器人時，應該考慮納入非口語話輪輪轉線索，因為它可以協助高齡者辨識機器人話輪的結束，並且順暢地接話。此外，本研究也指出，對於高齡者與機器人的對話互動而言，使用視線與手勢而非全身是更為合適且有效率的。

關鍵字：高齡者、人機互動、社會機器人、話輪輪轉、非口語線索

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Abstract

As the older population keep growing all over the world and the broadening gap in caregivers followed, how social robots could be utilized in elders' well-being has become one of the hottest issues. To equip robots with better conversational skills, how non-verbal turn-taking cues, which are essential in human conversation, could be utilized by the elderly in a casual conversation with social robots was of interest in the current study.

Experiment research was adopted to test the effects of non-verbal cues and different combinations of them on the noticeability, fluency of conversation, and HRI experience. The participants were asked to have a casual conversation with the robot, NAO, in a teatime setting. Behavior logs and self-report questionnaires were used to measure the variables. A total of 47 older adults participated. The results revealed that participants had perceived the non-verbal turn-taking cues and achieved fluent conversations. While subjective evaluation showed no effect of different combinations, the floor transfer offset indicated that using gaze and arm-gesture particularly facilitate the elderly users in taking turns.

In all, we suggested including non-verbal turn-taking cues when designing robots aiming to have casual conversations with older people. The non-verbal turn-taking cues help older adults identify the end of the robot's turn and transfer the floor smoothly. In

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addition, gaze and arm-gesture were found to be valuable and enough for the interaction rather than the whole body.

Keywords: Elderly users, Human-robot interaction, Social robots, Turn-taking, Non-verbal cues

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